Development of Training Kits for 21st Century Thai Teacher Production Based on the Visible Learning Concept to Enhance Education Quality Management in Schools under the Songkhla Primary Education Service Area Office 1

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ABSTRACT

This research aimed to develop and evaluate a training kit for Thai teachers in the 21st century, utilizing the Visible Learning concept to improve the quality of educational management in schools across the five southern border provinces of Thailand. The study focused on three areas: the efficiency of the training kit, comparative achievement of participants before and after training, and the satisfaction of teachers and educational personnel with the training program.

The training kit was designed to help teachers implement the Visible Learning framework, emphasizing student-centered learning, effective teaching strategies, and continuous assessment. The results of the efficiency test showed that the training kit achieved an efficiency value of 84.54/87.33, exceeding the standard criteria, demonstrating its effectiveness in enhancing teachers' competencies.

Comparative achievement analysis between pre-test and post-test scores indicated significant improvement (t-value = 19.745, p < 0.001), confirming that the training had a positive impact on teachers' skills in educational management. Additionally, the satisfaction survey revealed that teachers and educational personnel were highly satisfied with the training, especially in areas related to content clarity, participation, and post-training support.

In conclusion, the study found that the training kit based on the Visible Learning concept was effective in improving teacher skills and educational management in schools. The kit holds potential as a valuable tool for teacher development, particularly in the southern border provinces of Thailand, and could contribute to educational reform efforts in the country.

Keywords: Visible Learning, Teacher Training, Educational Management, 21st Century Education, Teacher Development, Comparative Achievement, Southern Border Provinces, Thai Teachers, Classroom Environment, Student-Centered Learning.

Introduction

Extensive educational research indicates that although improvements in educational technology, administrative frameworks, and teacher qualifications enhance academic achievement among children and youth, they frequently take a subordinate role to the direct influence of teacher-student interactions and the classroom atmosphere. Research conducted by Black and Wiliams (1998), Hattie (2008), Mahapoonyanont (2019; 2020) and Mahapoonyanont et al. (2017) underscores that constructive interactions between educators and learners substantially enhance student performance. Teacher attributes, including trustworthiness (ES = 0.90) and teacher-student interactions (ES = 0.72), exert significant influence. When students possess trust and confidence in their educators, their academic performance enhances throughout the class. This trust must be cultivated uniformly among all students to optimize learning outcomes (Hattie, 2009; Mahapoonyanont, 2020; Mahapoonyanont et al., 2017).

Educators are essential in fostering an effective learning environment by transitioning from the conventional "teacher" role to that of "coaches" or "learning facilitators." This transition entails functioning as facilitators, mentors, and coordinators of knowledge, while devising innovative educational activities centered on students. Effective 21st-century education is centered on students, necessitating that educators foster a conducive learning environment. This environment fosters positive mental health, resilience, and active engagement among students. A negative atmosphere can result in disengagement, inattention, and even bias against educators.

John Hattie's concept of Visible Learning establishes a framework for developing a classroom in which both educators and students comprehensively grasp the learning objectives and can assess individual advancement. Hattie (2008) contends that learning is more efficacious when educators concentrate on the individual responses and accomplishments of each student, rather than generalizing results based on collective performance. Educators must be vigilant regarding each student's feedback and modify their instruction accordingly.

The Three Levels of Observable Learning

Visible Learning functions through three levels:

1. Superficial Learning: Reinforcing existing knowledge via surface-level engagement.
2. Deep Learning: Enhancing comprehension through mind mapping, discourse, and inquiry.
3. Augmented Learning: Motivating learners to generate novel experiences and utilize knowledge across diverse contexts.

This method enables educators to establish classrooms that are both intentional and dynamic in their learning environment. The efficacy of this model resides in its capacity to render learning objectives transparent and quantifiable for both students and educators.

Protocols for Educator Advancement within Visible Learning

Leelapanyalert and Charoenkun (2017) identified two essential components for the effective implementation of Visible Learning by educators:

1. Teacher Development Policy: Formulating explicit learning concepts as an integral component of the school's learning management policy and disseminating them to educators and pertinent staff. Educational institutions ought to establish assessment criteria, such as rubrics, that are aligned with learning objectives and foster a culture of collaboration among educators. This encompasses systematic data collection, the exchange of pedagogical strategies, and the establishment of a community wherein educators perpetually learn from one another's experiences.

2. Teacher Training and Development: Educational institutions ought to implement initiatives aimed at instructing educators on the significance of providing constructive feedback and employing backward design methodologies. Educators ought to contemplate three essential inquiries: What is the objective of the learning process? How will I attain it? What is the subsequent step? Educators ought to be trained to monitor students' perceptions and comprehension, fostering reflective teaching methodologies that integrate peer feedback.

Educational Kits for Instructor Advancement

Training kits, as delineated by Phromwong (2013), are structured instruments for knowledge transfer that facilitate individual learning and behavioral modification. These kits are designed to enable self-directed study at the learner's preferred pace and location. Training kits serve as an efficacious approach for the professional development of educators and educational staff, especially within the framework of Visible Learning. This research seeks to develop a training kit grounded in the Visible Learning concept, acknowledging the necessity for ongoing teacher development in accordance with 21st-century educational requirements. This kit aims to improve the quality of educational management in schools, specifically in the five southern border provinces of Thailand. The incorporation of Visible Learning into teacher development programs will substantially enhance the nation's educational framework, allowing Thai educators to elevate student performance through well-defined learning objectives, improved feedback mechanisms, and collaborative pedagogical approaches.

In summary, promoting effective teacher-student interactions, establishing a positive classroom environment, and employing the Visible Learning framework are essential strategies for improving educational management. The creation of training kits founded on this concept will facilitate teacher development and, consequently, enhance student outcomes. Thailand's ongoing challenges in educational reform necessitate critical investment in teacher development through innovative methodologies for future success.

Research Objectives

This research aims to develop a training kit for Thai teachers in the 21st century, utilizing the Visible Learning concept to improve the quality of education management in schools under the Office of the Primary Educational Service Area, Songkhla Area 1. The specific objectives are as follows:

1. Develop the Training Kit
   To create a training kit for teachers to effectively educate 21st-century students, emphasizing *Visible Learning* according to the 80/80 criteria, where 80% of participants are expected to achieve at least 80% proficiency after the training.
2. Compare Pre- and Post-Training Results
   To compare the outcomes of teacher development before and after the training, evaluating the improvement in skills and knowledge related to education management through the training program.
3. Study Satisfaction
   To assess the satisfaction of teachers and educational personnel with the training kit, and evaluate its relevance and usefulness for educational development.

Literature Review

Visible Learning

Every student deserves good teachers—those who enable Visible Learning for their students. This involves: (1) progressing on measurable learning outcomes, (2) having clear and well-understood learning goals, (3) being aware of their own learning methods, (4) understanding how to improve their learning strategies, and (5) becoming self-directed learners, essentially "being their own teachers." Good teachers are those committed to their students' success, known as "teachers for their students."

John Hattie, in his book Visible Learning (2009), highlighted that many recommended teaching methods can negatively impact student learning. He introduced effect size as a measurement tool to evaluate the effectiveness of various teaching strategies. Hattie outlined 11 key mindsets of effective teachers:

1. I collaborate with other teachers.
2. I engage in dialogue, not monologue.
3. I create challenges.
4. I focus on learning, not just teaching.
5. I discuss learning principles with students and stakeholders.
6. I believe learning requires effort but can be enjoyable.
7. Evaluation provides me with feedback on my teaching performance.
8. I am a leader of change.
9. I assess the impact of my teaching.
10. I foster positive interactions.
11. I create an environment where students become their own teachers, developing self-regulation skills to manage their own learning (Hattie, 2009; Panich, 2020).

Levels of Learning

Hattie (2008) identified three levels of Visible Learning: surface, deep, and transfer learning.

1. Surface Learning: This involves building new learning on prior knowledge, as existing knowledge may not

always be accurate. Teachers should encourage students to think critically rather than merely memorize information. For instance, learning vocabulary can be enhanced by using mnemonic devices, vocabulary cards, and techniques like Cornell Notes, which structure information for better recall and reflection.

2. Deep Learning: Deep learning focuses on true understanding. Techniques like mind mapping and questioning help students organize and express their knowledge. Mind maps allow for easier report writing, while discussions promote long-term retention of information. Additionally, metacognitive strategies—planning, monitoring, and evaluating one's learning—empower students to take charge of their learning journey, leading to more effective learning outcomes.

3. Transfer Learning: Transfer learning is the application of knowledge to new and varied situations. It emphasizes problem-solving and critical thinking. Instead of posing problems directly, teachers can present situations for students to identify problems and propose solutions, encouraging deeper engagement and understanding.

To foster explicit learning, educators can ask guiding questions, such as:

- What are they studying?

- Why should they study this?

- How will they know they've learned it?

- Why is this learning important?

Assessment should reflect the diversity of students' learning progress, and students should have the opportunity to self-assess their grades and expectations (Hattie, 2009).

Principles of Assessment and Appraisal of Learning Outcomes

Ong-art Nai Pat (2010) examined the progression of learning measurement and assessment in two primary phases: conventional perspectives and contemporary viewpoints.

1. Conventional Perspective: Curriculum, Psychology, and Assessment
The conventional perspective on learning measurement and assessment, prevalent from 1900 to 2000, was shaped by the notions of social efficiency and scientific management, which were widely embraced in Western societies and subsequently adopted by Eastern societies. The emphasis was on utilizing scientific principles to address industrial and societal challenges, including education. Education was likened to an industrial production process, wherein students were regarded as "input factors" traversing the "production line" of educational institutions. The objective was to optimize efficiency, guaranteeing that the output, or students, adhered to elevated quality standards with minimal resource and time expenditure.
This methodology was grounded in the positivist paradigm, which pursues objective truth and knowledge via scientific methods. The curriculum from this perspective was designed to accommodate the majority of students, focusing on practical knowledge that corresponded with their abilities and interests. The objective was to minimize educational waste by prioritizing objective and formal assessment methods (Ong-art Nai Pat, 2010). Figure 2.1 depicts the teaching management model grounded in social efficiency theory (Ong-art Nai Pat, 2010, p.5).
Throughout this period, psychological theories including Thorndike's associationism and behaviorism, as proposed by Hull, Skinner, and Gagne, were extensively implemented in educational settings. Learning was perceived as hierarchical, with cognitive development advancing through stages, as subsequently formalized by Bloom and Gagne. The impact of these psychological theories fostered the notion that assessments reflected learning (Test = Learning), resulting in the widespread utilization of objective multiple-choice examinations to evaluate students' knowledge.
The focus was on objectivity, removing any subjective knowledge or judgment stemming from teachers' experiences. Consequently, standardized testing methods prevailed in classroom assessments, guaranteeing that measurement outcomes were unbiased and striving to attain "true knowledge" (Ong-art Nai Pat, 2010).

This measurement system, primarily reliant on multiple-choice tests, originated from Thorndike's contemporary measurement principles. It was chiefly employed for the selection of individuals based on their intelligence and other attributes, frequently for military or institutional objectives. The standardized IQ test served as a crucial instrument for maintaining consistency and accountability in education (Ong-art Nai Pat, 2010).

2. Innovative Viewpoints: Curriculum, Education, and Evaluation

The novel viewpoints on curriculum, learning, and assessment emerged from academics who contested the industrial model of education. These academics, referred to as "Classroom Social-Culturalists," perceived schools as social entities rather than industrial establishments. They contended that interactions between students and educators, along with a nurturing school environment, were essential for effective learning. This methodology is based on the interpretivist or constructivist paradigm, which asserts that knowledge is socially constructed, influenced by cultural values and context, rather than being a universal truth (Ong-art Nai Pat, 2001, 2008, 2010).

The curriculum formulated under this perspective emphasizes educational equity, asserting that all students can achieve success. It underscores critical thinking, the practical application of knowledge, and collaboration, motivating learners to address intricate problems through diverse intelligences. The objective is to furnish learners with significant experiences applicable to their daily lives. This perspective is consistent with the Thai Basic Education Curriculum of 2001, which prioritizes theoretical knowledge, practical application, social engagement, and moral and ethical development (Ministry of Education, 2001).

Constructivist psychology underscores the dynamic nature of learning, wherein knowledge develops through social interaction and ongoing reflection. Students assess and analyze their own cognitive processes (metacognition), an essential component of cognitive theory. The transition from positivism to constructivism has resulted in substantial alterations in the methodology of learning assessment (Ong-art Nai Pat, 2010). Conventional assessments, such as multiple-choice examinations, are no longer regarded as adequate for evaluating significant learning outcomes.

Challenges Associated with Conventional Learning Evaluation

Numerous issues with conventional assessment methods have been recognized, as articulated by scholars including Black and Wiliam (1998), Stiggins (2002, 2005), and Ong-art Nai Pat (2010):

1. Superficial Measurement: Conventional evaluations frequently assess intricate knowledge of minor subjects, which lack practical utility in everyday life and are readily forgotten.
2. Ambiguity: Numerous educators lack clarity regarding the objectives of assessments and their purpose.
3. Insufficient Motivation: Assessment scores are frequently not utilized to inspire or incentivize students to engage in learning.
4. Disjunction of Instruction and Evaluation: Evaluations are frequently administered formally, detached from instructional activities, resulting in inefficacy in classroom management.
5. Focus on Group-Referenced Assessment: This methodology accentuates competition among learners, diminishing the self-confidence and motivation of lower-performing students.
6. Excessive Dependence on Quantitative Metrics: Educators prioritize objective assessments and standardized protocols over evaluating practical competencies in real-world situations.
7. Overlooking Alternative Assessment Methods: Techniques such as peer evaluations or oral inquiries are frequently disregarded.
8. Emphasize External Monitoring: Educators and administrators often prioritize standardized assessments, such as those administered by the National Institute of Educational Testing Service (NIETS), over formative evaluations that foster individual student growth.

The transition from conventional measurement techniques rooted in positivism to more comprehensive methods based on constructivist paradigms signifies a wider trend towards educational reform. The objective is not solely to evaluate knowledge but to augment learning by rendering assessment a significant, cohesive component of the educational process. This necessitates transcending standardized testing to adopt varied, authentic assessment methods that accurately represent real-world learning and promote student growth.

Competence of Teachers in Educational Assessment

Standards for Educator Proficiency in Student Assessment

Standards for Professional Knowledge and Experience (Teachers Council, 2013)

The Teachers Council of Thailand requires educators to hold a minimum of a bachelor's degree in education or an equivalent qualification, validated by the Teachers Council. The following standards outline the necessary professional knowledge and experience for teachers:

Standards of Knowledge:
1. Teaching Profession
2. Educational Philosophy
3. Language and Cultural Studies
4. Psychology for Educators
5. Curriculum Development
6. Instruction and Classroom Management
7. Research for Educational Improvement
8. Educational Innovation and Information Technology
9. Measurement and Evaluation of Educational Outcomes
10. Educational Quality Assurance
11. Morality, Ethics, and Professional Conduct

Professional Experience Standards: Teachers must complete a minimum of one year of teaching practice in educational institutions, meeting the evaluation criteria set by the Teachers Council, which include:
1. Professional training during their studies
2. Teaching practice in specific subject areas within educational institutions

Teacher Evaluation Culture

Wisanu Supsombat (2006) identified five key components in the culture of teacher evaluation within educational institutions:

1. Understanding and knowledge of pedagogical evaluation
2. Beliefs about instructional evaluation
3. Ongoing performance appraisal practices
4. Proficiency in teaching assessment
5. Desired attributes in teaching evaluation

These elements emphasize the importance of teacher evaluation in promoting effective teaching methods and improving educational outcomes.

Attributes of Thai Educators in the Next Decade

Charoenwich Somphongtham and colleagues (2010) explored the attributes that will be crucial for Thai educators over the next decade (2019). The study identified four essential domains for teacher development:
1. Knowledge and Professional Experience: This includes language proficiency, technology skills for teaching, and advanced pedagogical expertise.
2. Teacher Personality: Includes multiple intelligences such as emotional, intellectual, moral, social intelligence, and the ability to overcome challenges.
3. Educational Development Leadership: Teachers must exhibit academic leadership and transformational leadership to drive educational progress.
4. Morality and Professional Ethics: Teachers must demonstrate both personal and professional ethics, with a focus on ethics in service, professional behavior, and social responsibility.

The aspect of Knowledge and Professional Experience underscores the necessity for teachers to have practical assessment skills. Teachers must be proficient in designing and using various assessment tools, including cognitive, psychomotor, skill-based, portfolio, and diagnostic assessments. These competencies enable educators to assess student learning at different stages—pre-instruction, during instruction, and post-instruction—and use this data to summarize and apply learning outcomes in practical contexts.

The standards and competencies for teachers in educational assessment highlight the importance of comprehensive knowledge, ethical conduct, and hands-on experience. As the educational landscape evolves, teachers must be equipped with both traditional teaching skills and advanced competencies in student assessment and evaluation. The framework established by international and Thai standards provides a robust foundation for teacher development, ensuring that educators are prepared to enhance educational quality in the 21st century.

Training Kit Development for 21st-Century Teachers

Definition of Training

Training is a crucial instrument for human resource development, focused on imparting knowledge and improving practical skills. Training kits are integral to this process, functioning as an essential resource. Rapin Phosri (2006) defines a training kit as a pedagogical tool that embodies learning objectives, challenges, and content requirements, integrating learning activities and assessments into a coherent framework that promotes efficient learning management. Jiraphon Rawangkarn (2012) stated that training kits are a form of mixed media learning kit designed to enhance specific skills, functioning through a systematic, learner-centered approach.

In summary, training entails the systematic execution of educational activities aimed at improving knowledge, skills, and proficiency, which can subsequently be utilized to increase efficiency in professional practice.

Advantages of Training

Training is an essential management instrument employed to enhance organizational efficacy. Sukhothai Thammathirat Open University (2001) delineated the advantages of training as follows:
1. Augmenting knowledge, skills, and competencies to enhance work performance.
2. Enhancing morale and cultivating a favorable disposition towards the organization.
3. Mitigating work-related challenges through enhanced utilization of tools and resources.
4. Alleviating the burden on supervisors by diminishing the necessity for continual oversight.
5. Resolving management issues, enhancing coordination, and tackling workforce deficiencies.
6. Enhancing organizational stability through the promotion of ongoing employee development.

Definition of a Training Kit

Training kits are vital instruments in enhancing the learning process, offering pre-structured resources that minimize preparation time for instructors and enable trainees to revisit material following practice sessions. Nantawat Phattrakanan (2012) characterized training kits as media resources assembled into a unified package aimed at effectively achieving training objectives. Totsaporn Sangsawang (2016) asserted that training kits incorporate multimedia and adhere to a systematic approach to cultivate knowledge and attitudes in accordance with organizational objectives.

In summary, training kits are documents or materials that encompass essential content, methodologies, media, and evaluation tools tailored to effectively address the needs of trainees.

Significance of Training Kits

Systematically developed training kits are advantageous for both trainers and trainees. As per Siriphan Sai Hong and Somprasong Wittayakiat (2011), the benefits are:
1. For trainers: Training kits offer comprehensive activity guides, media documents, and instructional materials, thereby conserving time in training preparation.
2. For trainees: Training kits enhance motivation and engagement through diverse activities and self-directed learning, mitigating monotony and enabling trainees to revisit materials at their convenience.

Elements of Training Kits

Nantawat Phattrakanan (2012) delineated the essential components of training kits as follows:
1. Training Manual: Offers instructions on training procedures, encompassing objectives, activities, and assessment techniques.
2. Training Media: Diverse media employed in training to improve comprehension and retention.
3. Evaluation Instruments: Tools such as assessments and surveys to measure knowledge, skills, and satisfaction with the training package.

Manufacture of Training Kits

The creation of a training kit encompasses several essential steps, including:
1. Establishing Objectives: Articulating explicit, behavior-oriented objectives that direct both instructors and learners.
2. Content Organization: Arranging the content in accordance with the training objectives to ensure a logical and effective progression of learning.
3. Designing Training Media: Choosing suitable media that correspond with training objectives, facilitate active learning, and improve the learning experience.
4. Assessment of Training Kits: Assessing the efficacy of the training kit by gauging trainee satisfaction, knowledge retention, and the overall congruence of the kit with its specified objectives.

Significance of Assessing Training Kits

Assessment is essential for determining the efficacy of training kits. The assessment procedure encompasses:
1. Objectives: Assessing the alignment of training objectives with the requirements and aspirations of the organization and participants.
2. Content: Evaluating the alignment of the training material with the objectives and its appropriate sequencing.
3. Trainees: Assessing pre- and post-training performance to confirm that the content is pertinent and comprehensible to all participants.
4. Training Strategies: Ensuring that the training methodologies foster active engagement and incremental learning advancement.
5. Training Environment: Evaluating the suitability of the venue, timing, and materials utilized in the training.

Development and Production of Training Kits

An effectively constructed training kit comprises elements such as manuals, media, activities, and assessments. Warinya Phuprang (2020) delineated a five-step procedure for training kit development, referred to as the ADDIE model:
1. Analysis: Determining training requirements and establishing objectives.
2. Design: Organizing the content and activities.
3. Development: Formulating the instructional materials and resources.
4. Execution: Conducting the training.
5. Evaluation: Analyzing the efficacy of the training kit.
Elements of an Effective Teacher Training Kit
A thorough teacher training kit must encompass:
- Content: Pertinent and pragmatic information that corresponds with educational objectives.
- Learning Design: Engaging activities that promote experiential learning.
- Activities: Exercises designed to enhance pedagogical skills and promote communication among participants.
- Practicum: Opportunities for practical application in real-world contexts.
- Assessment: Ongoing feedback and oversight of educational results.
- Support: Sustained guidance and mentorship to assist educators in implementing new knowledge within the classroom.

Final Assessment

The creation of a meticulously organized training kit is crucial for the efficient transmission of knowledge, skills, and attitudes in professional training settings. A training kit that includes extensive content, practical exercises, and rigorous assessment methods can markedly improve the effectiveness of the learning process for trainers and trainees alike. Quality training kits enhance organizational performance and foster the long-term development of personnel skills through continuous support and practical application.
Elements of Training Kits for Cultivating 21st-Century Thai Educators Utilizing the Visible Learning Framework

The training kits intended to cultivate Thai educators for 21st-century learners, employing the Visible Learning framework to improve educational administration, must encompass the following elements:

1. Explicit Learning Objectives: The Visible Learning framework advocates for educators to formulate learner-centered objectives that foster profound comprehension and skill enhancement, in accordance with established educational standards (Hattie, 2012).

2. Effective Teaching Strategies: Educators are urged to implement techniques such as small group instruction, feedback, and ongoing assessment of learning to enhance pedagogical practices (Hattie, 2009).

3. Data Utilization and Evaluation: Educators are instructed in the application of data and learning analytics to assess student advancement, enhancing pedagogical methods through actionable insights (Wiggin & McTighe, 2005).

4. Establishing a Learning Culture: This concept underscores the importance of cultivating a supportive learning environment in which educators are pivotal in facilitating students' growth (Hattie, 2012).

5. Employing Learning Activities and Tools: The training module offers direction on integrating learning activities consistent with Visible Learning principles, guaranteeing that learning experiences are both efficacious and engaging (Hattie & Timperley, 2007).

6. Monitoring and Evaluation: Ongoing monitoring and evaluation of student learning enable educators to enhance their activities for improved learning outcomes (Hattie, 2009).

7. Empowering Learning: The training enhances teacher confidence and competencies, facilitating the establishment of classroom environments that promote sustainable learning (Hattie, 2012).

Visible Learning training empowers educators to analyze learning data, create effective teaching activities, and consistently enhance instructional efficacy to promote student achievement.

Professional Learning Community (PLC) and Educator Development

A Professional Learning Community (PLC) is essential for teacher development as it promotes sustained learning and collaboration among educators.

1. Knowledge and Experience Exchange: Professional Learning Communities (PLCs) facilitate the sharing of ideas and successful methodologies among educators, fostering collective advancement and enhanced instructional efficacy (Hattie, 2012).

2. Enhancing Lesson Planning: Collaborative dialogues regarding lesson plans enable educators to customize content to meet student requirements (Wiggin & McTighe, 2005).

3. Shared Accountability: Professional Learning Communities (PLCs) encourage a communal obligation for student outcomes, enhancing collaboration in data analysis and pedagogical strategies (Hattie & Timperley, 2007).

4. Collaborative Environment: Professional Learning Communities foster a setting for reciprocal learning and assistance among educators, facilitating innovation and ongoing enhancement (Wiggin & McTighe, 2005).

5. Promoting Change and Innovation: Professional Learning Communities (PLCs) facilitate pedagogical innovation by sharing novel ideas and methodologies, thereby improving student learning outcomes (Hattie, 2012).

6. Problem Solving and Support: Professional Learning Communities (PLCs) enable educators to collaboratively tackle instructional challenges, cultivating solutions that enhance learning experiences (Wiggin & McTighe, 2005).

The role of PLCs in teacher development is essential for fostering a culture of collaborative learning and enhancement, which ultimately results in more effective instruction and improved student outcomes.

High-Quality Professional Learning Communities for Enhanced Educator Development

A high-quality PLC depends on several essential factors:

1. Explicit Objectives: Precise, quantifiable goals that align with institutional aims are crucial for enhancing student learning outcomes (Hattie, 2012).

2. Collaboration and Knowledge Sharing: Effective Professional Learning Communities (PLCs) promote collaboration, enabling educators with diverse experiences to exchange ideas and solutions (Hattie & Timperley, 2007).

3. Data Awareness and Enhancement: Ongoing data assessment enables Professional Learning Communities (PLCs) to modify educational activities according to actual results, thereby improving instructional efficacy (Hattie, 2009).

4. Continuous Development: Educators and educational personnel within a Professional Learning Community

(PLC) must be dedicated to perpetual development, deriving insights from experience, and enhancing instruction based on evaluations (Wiggin & McTighe, 2005).
5. Observable Accomplishments: An effective PLC must exhibit distinct enhancements in student learning outcomes, with lesson plans and methodologies consistently optimized (Hattie, 2012).
6. Support and Implementation: Robust leadership endorsement within a Professional Learning Community (PLC) guarantees its effective execution and cultivates a culture of collaborative learning (Hattie, 2009).

The Function of Educators in Observable Learning

Educators serve a crucial function within the Visible Learning framework, functioning as facilitators of the educational process:
1. Establishing Explicit Learning Objectives: Educators formulate precise, data-informed learning targets customized for each student (Wiggin & McTighe, 2005).
2. Effective Teaching Strategies: Educators utilize evidence-based methods, including formative assessments and progress monitoring, to optimize learning results (Hattie & Timperley, 2007).
3. Delivering Feedback: Explicit and constructive feedback aligned with educational objectives aids students in comprehending their advancement and areas necessitating enhancement (Hattie & Timperley, 2007).
4. Fostering Student Agency: Educators promote student accountability for their learning, cultivating autonomy and motivation (Hattie, 2009).
5. Progress Monitoring: Educators employ data tools to assess student learning advancement and modify instruction as necessary (Wiggin & McTighe, 2005).

The Function of Students in Observable Learning

In Visible Learning, students take an active role in overseeing their own educational progress.
1. Establishing Learning Objectives: Students formulate and monitor their own educational goals utilizing data from assessment results (Hattie, 2012).
2. Evaluation and Monitoring: Students evaluate their advancement, utilizing instruments to confirm they are achieving their educational objectives (Wiggin & McTighe, 2005).
3. Collaboration: Students engage with peers, enhancing a communal learning atmosphere that promotes collective achievement (Hattie, 2009).
4. Active Learning Strategies: Learners engage in the exploration of learning methodologies, assuming accountability for their educational results (Hattie & Timperley, 2007).

Visible Learning prioritizes student engagement and accountability, empowering learners to assume an active role in their education.

Teacher Training Resources for Visible Learning

Training kits for educators employing Visible Learning should encompass the subsequent units:
1. Theory: Presenting the tenets of Visible Learning via research and illustrations (Hattie, 2009).
2. Effective Pedagogical Approaches: Educating instructors in methodologies that promote assessment and feedback to enhance educational results (Hattie & Timperley, 2007).
3. Application: Practical training in lesson planning and progress monitoring (Wiggin & McTighe, 2005).
4. Analysis and Enhancement: Instructing educators to evaluate student performance and refine lesson plans accordingly (Hattie, 2012).
5. Establishing a Supportive Environment: Educating teachers to cultivate learning environments that promote student development (Hattie, 2009).

Contentment in Education

Satisfaction is pivotal in the learning process.

1. Definition: Satisfaction arises when positive emotions surpass negative ones, enhancing a learner's overall contentment with their educational experience (Kotler, 2000).
The influence on learning: Cultivating satisfaction in learners enhances motivation and results in elevated academic performance (Pongsopa, 1999).

3. Strategies to Enhance Satisfaction: Educators can enhance student satisfaction by aligning curricula with student requirements, offering reinforcement, and employing innovative pedagogical techniques (Pongsopa, 1999).

In summary, the Visible Learning methodology, alongside efficient Professional Learning Communities and teacher development resources, provides educators with the necessary tools to enhance student outcomes. Educators are essential in establishing explicit objectives, employing efficient methodologies, and delivering constructive feedback, while learners are motivated to assume responsibility for their education. Satisfaction is a crucial element in education, driving students to attain superior results. By employing these strategies, educational institutions can proficiently equip students for success in the 21st century.

Research Conceptual Framework

The shift from passive learning, where students listen to teachers, to active learning, where students engage in hands-on experiences, represents a critical transformation in educational practices. This change requires structured policy development, teacher training, and administrative support to align learning management with the principles of Visible Learning (Hattie, 2009).

Key Guidelines:

1. Policy Development: School administrators should implement a learning process focused on Visible Learning, promoting active learning and reflection to improve student outcomes.
2. Teacher Development: Continuous teacher training and coaching are essential. Coaching facilitates observable changes, promotes development, and addresses challenges, ensuring effective implementation of the Visible Learning model (Hattie, 2012).
3. Administrative Guidelines: Performance assessment criteria using rubrics should align with Visible Learning goals. These rubrics help teachers understand clear objectives, guiding their teaching practices (Wiggin & McTighe, 2005).

Factors Influencing Visible Learning:

1. Teacher Passion and Commitment: Teacher dedication, confidence, and expertise are critical for fostering a conducive learning environment that supports Visible Learning (Hattie, 2012).
2. Teacher Development Projects:
    o Formal and Informal Training: Internal and external training, peer observation, and experience sharing are necessary.
    o Feedback: Teachers should provide timely feedback, which significantly improves learning outcomes (Hattie & Timperley, 2007).
3. Curriculum and Lesson Planning: Teachers should develop challenging lessons that encourage participation, integrating both vertical and horizontal curriculum planning to help students set and achieve their own learning goals (Hattie, 2009).
4. Pre-lesson Considerations: A safe, trusting environment where students feel free to express themselves and view mistakes as part of learning is essential. Teachers act as both Activators and Evaluators to effectively guide learning, using backward design to plan lessons (Wiggin & McTighe, 2005).
5. Providing Feedback: Teachers should offer meaningful feedback, adjust lessons based on performance, and emphasize three key questions: "What is the goal?", "How will students reach it?", and "What are the next steps?" (Hattie & Timperley, 2007).

The Visible Learning approach necessitates a comprehensive transformation in teaching practices, integrating clear learning goals, timely feedback, effective curriculum design, and a supportive learning environment. Through policy development, teacher training, and robust administrative support, schools can effectively implement Visible Learning, equipping students with the skills needed for lifelong success.
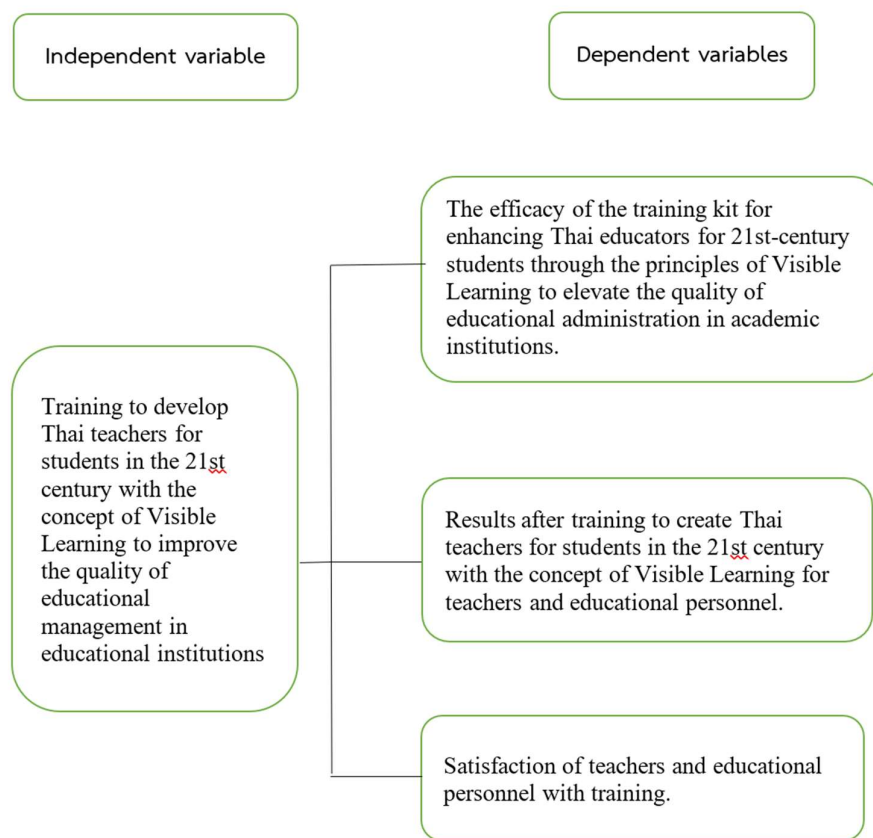
Figure 1 Research Conceptual Framework

Research Methodology
Scope of Research
1. *Content Scope*

    This research focuses on the competencies of Thai teachers in the 21st century and learning management using the *Visible Learning* concept to enhance the quality of educational management in educational institutions.

2. *Population and Sample Scope*

    2.1 Population: The population consists of teachers and educational personnel working in educational institutions located in the five southern border provinces of Thailand.

    2.2 Sample Group: The sample includes 30 teachers and educational personnel from educational institutions in the five southern border provinces, selected voluntarily in the 2023 academic year.

3. *Variable Scope*

    3.1 Independent Variables: The independent variables include the training program for teachers, focusing on the development of Thai teachers for 21st-century students using the *Visible Learning* concept to improve the quality of educational management.

    3.2 Dependent Variables:

    3.2.1 The effectiveness of the training kit designed for developing Thai teachers for 21st-century learners using the *Visible Learning* concept to enhance educational management.

    3.2.2 The outcomes following the training aimed at improving the quality of educational management for teachers and educational personnel.

    3.2.3 The satisfaction of teachers and educational personnel regarding the training program focused on developing Thai teachers using the *Visible Learning* concept for improving educational management quality.

Research Procedures

The study sought to create a training kit to empower Thai educators with competencies for 21st-century education, utilizing the Visible Learning framework to improve educational administration. The procedures were structured around five primary steps:

We convened a focus group of 14 educational experts, including lecturers, school directors, and teachers, to examine the necessity of the training kit. Participants offered perspectives on contemporary educational requirements, particularly the necessity for enhancements in teaching grounded in Visible Learning principles.

Creation of the Training Kit:

Phase 1: The researcher engaged with specialists to examine pertinent literature and evaluate the basic education curriculum, emphasizing Visible Learning principles.
Phase 2: Through collaboration with educators, we established a conceptual framework for the training kit, incorporating systematic analysis and design.
Phase 3: The draft training kit underwent evaluation for appropriateness and coherence, subsequently leading to the development of research instruments, including a composite assessment and a satisfaction survey. The trial of the Training Kit involved 30 volunteer educators from the southern border provinces. The process comprised an initial assessment of achievements, followed by a sequence of workshops and practical applications of the training kit over multiple weeks. Researchers performed weekly classroom visits to offer consultation and gather feedback for enhancements.

The training kit was assessed by measuring teacher proficiency in Visible Learning, student academic performance, and teacher satisfaction following the training.

Results Dissemination: The findings were communicated via international conferences, journals, and websites to enhance the learning network and facilitate the application of the training kit in diverse contexts.

1. Research Findings

This research aimed to develop and evaluate a training kit designed to equip Thai teachers with the necessary skills to educate students in the 21st century, using the Visible Learning concept. The objective was to enhance the quality of educational management in schools across the five southern border provinces of Thailand. The results are presented in three main areas: the efficiency of the training kit, comparative achievement of participants before and after the training, and the satisfaction of teachers and educational personnel with the training.

1. Efficiency of the Training Kit

The research tested the efficiency of the training kit developed for Thai teachers in the 21st century, using the Visible Learning concept. Table 1 presents the results of the efficiency test, where participants completed five modules, each scored out of 10 points. The scores for each module are provided, and the overall efficiency of the training kit was measured using two indicators: E1 (efficiency based on module scores) and E2 (efficiency based on learning outcomes).

Table 1: Results of the Efficiency Test

Score	E1 Score (50 pts)	E2 Score (20 pts)
Average	42.27	17.47
Efficiency	84.54	87.33

The results showed an average E1 score of 42.27 out of 50 and an E2 score of 17.47 out of 20, yielding an overall efficiency of 84.54/87.33, which exceeded the standard criteria. This indicates that the training kit was highly effective in developing the competencies required for teachers to implement the Visible Learning framework in their teaching practices.

2. Comparative Achievement Before and After Training

The second part focused on comparing the achievement of teachers and educational personnel before and after participating in the training. Pre-test and post-test scores of 30 participants were analyzed to assess the effectiveness of the training. The pre-test scores ranged from 3 to 6 points, while post-test scores ranged from 7 to 9 points.

Table 2: Comparative Results of Teacher Achievement Before and After Training

Score	Average	Standard Deviation	t-value	p-value
Pretest	4.73	0.98	19.745	.000
Posttest	8.03	0.76		

Table 2 presents comparative results, showing a significant improvement in scores. The average pre-test score was 4.73, with a standard deviation of 0.98, while the average post-test score was 8.03, with a standard deviation of 0.76. The t-test results indicated a t-value of 19.745 and a p-value of .000, showing that the improvement in scores was statistically significant ($p < 0.001$). This demonstrates that the training significantly enhanced the participants' teaching skills and their ability to apply the Visible Learning concept to improve educational management.

3. Satisfaction of Teachers and Educational Personnel

The third part examined the satisfaction levels of teachers and educational personnel with the training program. Table 3 summarizes the satisfaction scores, covering various aspects such as clarity of content, relevance of Visible Learning concepts, participation in activities, expected impact on educational quality, and post-training support.

Table 3: Satisfaction Scores of Teachers and Educational Personnel

Evaluation Topics	Average Score	Satisfaction Level
1. Clarity and understanding of training content	4.5	Very high
2. Visible Learning concepts applied to teaching	4.2	High
3. Participation and activities during training	4.6	Very high
4. Expected impact on educational quality management	4.3	High
5. Post-training support and follow-up	4.4	High

The results show a high level of satisfaction across all areas, with average scores ranging from 4.2 to 4.6 on a 5-point scale. Participation and activities during the training received the highest average score of 4.6, indicating that the interactive and engaging nature of the training was well-received by participants. The clarity and understanding of the training content also scored highly (4.5), while the relevance of Visible Learning to teaching and post-training support scored 4.2 and 4.4, respectively.

Overall, teachers and educational personnel expressed strong satisfaction with the training program, particularly in terms of its ability to improve their teaching strategies and contribute to better educational management in their institutions.

In conclusion, the research demonstrates that the training kit designed for 21st-century Thai teachers, based on the Visible Learning concept, was effective in enhancing teacher competencies and improving educational management. The training significantly improved participants' achievement and was met with high levels of satisfaction from teachers and educational personnel. This training model can serve as an essential tool for developing the teaching workforce in the southern border provinces of Thailand, preparing them to meet the challenges of modern education.

2. **Conclusion**

This research used Visible Learning to develop and evaluate a training kit to equip Thai teachers with 21st-century teaching skills and improve educational management in five southern border provinces. The study found the training kit effective in three areas: efficiency of the training materials, comparative achievement of participants

before and after training, and teacher and educational personnel satisfaction with the program.

1. Training Kit Efficiency

E1 and E2 measured the training kit's efficiency based on module scores and learning outcomes. The average E1 score was 42.27 out of 50 and the E2 score was 17.47 out of 20, resulting in an efficiency of 84.54/87.33, exceeding the standard criteria. This high efficiency suggests that the training kit developed the competencies teachers needed to implement the Visible Learning framework in their teaching, preparing them for modern education challenges.

2. Pre- and Post-Training Performance

After training, participant achievement improved significantly. With 30 participants, the average pre-test score was 4.73 and the post-test score was 8.03. The t-test analysis showed a significant improvement ($p < 0.001$) with a t-value of 19.745 and a p-value of .000. This shows that the training improved participants' teaching skills and ability to use Visible Learning to improve educational management. Teachers and educational staff were better equipped to help students learn and improve their outcomes.

3. Teacher and Educational Staff Satisfaction

Teachers and educational staff gave the training program high satisfaction scores of 4.2 to 4.6 on a 5-point scale. The highest satisfaction score (4.6) was for training participation and activities, indicating that the interactive program was well received. Clear training content scored 4.5, Visible Learning concepts were relevant (4.2), and post-training support was good (4.4). Overall, high satisfaction levels across all areas show that the program met participants' needs and improved their teaching.

Finally, the Visible Learning training kit for 21st-century Thai teachers improved teacher competencies and educational management. The training improved teacher performance, as shown by pre- and post-test results, and participants were satisfied. This training model helps teachers in Thailand's southern border provinces meet modern education standards and improve student learning.

Discussion

This research sought to create a training kit that provides Thai educators with the competencies required to instruct 21st-century learners through the Visible Learning framework, thereby improving the quality of educational administration in the southern border provinces of Thailand. The research findings demonstrate that the training kit was effective in several critical domains: efficiency, participant achievement, and satisfaction levels. This discussion will concentrate on these three aspects in accordance with established educational theories and research.

1. Effectiveness of the Training Kit

The training kit's efficiency, indicated by the E1 and E2 scores, surpassed the established standards, evidencing its efficacy in improving participants' teaching skills. The Visible Learning framework underscores the necessity for explicit learning objectives, immediate feedback, and empirically supported instructional methods (Hattie, 2009). The training kit's efficiency score of 84.54/87.33 substantiates this approach by demonstrating that educators can enhance their capacity to establish explicit learning objectives and deliver constructive feedback. The elevated efficiency scores correspond with prior research indicating that structured training programs, which integrate these principles, improve teacher performance (Hattie & Timperley, 2007).

The training modules demonstrated a meticulous organization and successfully conveyed content, as evidenced by the elevated E1 score (42.27 out of 50). The E2 score of 17.47 out of 20 indicates effective learning outcomes, further evidencing that participants successfully implemented Visible Learning strategies in their instruction. The findings align with research indicating that teacher development programs incorporating visible learning practices enhance student engagement and academic performance (Hattie, 2009).

2. Comparative Performance Pre- and Post-Training

The notable enhancement in teacher performance pre- and post-training underscores the efficacy of the training kit. The mean post-test score (8.03) was markedly superior to the pre-test score (4.73), exhibiting a statistically significant t-value of 19.745 (p <.001). This finding substantiates the assertion that professional development incorporating the practical application of learning theories, such as Visible Learning, results in improved educational outcomes (Wiggins & McTighe, 2005).

The training kit integrates active pedagogical techniques, student feedback, and self-reflection, all of which Visible Learning prioritizes. The noted enhancement in post-test scores corresponds with research indicating that professional development targeting these areas leads to improved instructional practices (Hattie, 2012). The notable t-test result verifies that the training significantly enhanced teacher competence, thereby improving educational management.

3. Ensure the satisfaction of educators and academic staff

The elevated satisfaction levels reported by educators and educational staff further corroborate the efficacy of the training program. The program received positive feedback, as evidenced by the satisfaction scores ranging from 4.2 to 4.6 on a 5-point scale. Participation and activities during training garnered the highest score (4.6), underscoring the significance of interactive and engaging training methodologies in professional development (Guskey, 2002).

This corresponds with Hattie's (2009) research, which underscores that active participation and engagement during training are crucial for achieving successful learning outcomes. The elevated satisfaction levels indicate that the training content was pertinent and applicable, especially regarding the enhancement of teaching strategies and educational quality management. The notable score for post-training support (4.4) highlights the significance of ongoing assistance in professional development, facilitating teachers' application of acquired knowledge in the classroom (Desimone, 2009).

The findings demonstrate that the participants comprehended the Visible Learning concept and regarded it as significantly pertinent to their pedagogical practices. Prior studies indicate that professional development programs tailored to teachers' needs and the practical requirements of teaching result in greater satisfaction and are more likely to effect changes in classroom practices (Darling-Hammond, Hyler, & Gardner, 2017).

The Visible Learning framework-based training kit for Thai educators in the 21st century significantly enhanced teacher competencies and improved educational management. The elevated efficiency scores, notable enhancement in performance, and favorable feedback from participants indicate the training's efficacy. This model can serve as an invaluable resource for teacher development, particularly in areas like the southern border provinces of Thailand, where educational management must confront the intricacies of contemporary teaching and learning contexts.

According to the results, future professional development programs should keep using the Visible Learning principles. These principles stress the importance of clear learning goals, feedback, and using evidence-based teaching methods to help students do better. Furthermore, ongoing support and follow-up post-training will be essential for maintaining the advancements achieved during the training sessions.

Recommendations

Recommendations for implementing research findings

1. Extensive growth and utilization This training kit warrants consideration for implementation in educational institutions beyond the five southern border provinces, as research indicates its effectiveness in enhancing teachers' instructional skills. The expansion of this training kit must involve content and methods tailored to the specific contexts and needs of teachers and students in various regions to ensure optimal efficiency.

2. Supplementary training and subsequent evaluation We should implement ongoing and additional training to enable teachers to continuously enhance their teaching skills and align with the Visible Learning framework. Post-training follow-up is essential. We should assess

teachers' performance post-training and provide additional consultation to facilitate effective teaching improvement.

3. Support and networking Creating networks among trained teachers and educational personnel will promote the exchange of knowledge and experiences, thereby supporting the ongoing and sustainable development of teaching practices. Support from educational agencies, including the Ministry of Education and other relevant organizations, should encompass both resources and supplementary training arrangements.

Recommendations for subsequent investigations

1. The research should be extended to diverse cultural and geographic contexts to evaluate the training kit's effectiveness across a broader spectrum, thereby generating comprehensive data and facilitating adjustments to enhance its suitability for various regions.

2. Long-term monitoring and evaluation of the training are necessary to assess its sustainable impact on the quality of education for both teachers and students. A long-term evaluation will assess the durability and effectiveness of the Visible Learning concept in enhancing teachers' skills and knowledge.

3. The development of learning media and technology that facilitate training is essential, particularly using digital media and online platforms. This enhancement will improve the accessibility and application of the Visible Learning concept in teaching, thereby enabling teachers to effectively implement the knowledge acquired.

We should encourage community involvement in the training process to foster understanding and enhance the quality of education. Community participation enhances collective responsibility for the advancement of children's education in the region.

5. Additional research is necessary to examine factors influencing the effectiveness of training, including the learning environment, utilized teaching media, and suitable teaching techniques. Subsequent research will yield detailed insights that can enhance the training package.

6. Continuous support and follow-up on training outcomes are essential for the ongoing improvement and development of teachers' instructional skills. Post-training support enhances confidence and preparedness for the application of knowledge in practical contexts.

Acknowledgement

References

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education, 5*(1), 7-74. https://doi.org/10.1080/0969595980050102

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38*(3), 181-199. https://doi.org/10.3102/0013189X08331140

Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching, 8*(3), 381-391. https://doi.org/10.1080/135406002100000512

Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.

Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning*. Routledge.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-112. https://doi.org/10.3102/003465430298487

Kotler, P. (2000). *Marketing management: The millennium edition*. Prentice Hall.

Leelapanyalert, T., & Charoenkun, N. (2017). Guidelines for the development of teachers at Prep International Kindergarten based on the concept of visible learning. *Online Journal of Education (OJED), 12*(4), 708-723.

Mahapoonyanont, N., Hansen, S., & Poskitt, J. (2017). A comparative study of models to support teachers' capacity in assessment for learning in Thailand and New Zealand. *New Zealand Association for Cooperative Education 2019 Refereed Conference Proceedings*.

Mahapoonyanont, N. (2019). Integration of teaching, academic services, and research to reinforce the professional learning community: Work-integrated learning for teacher students. *New Zealand Association for Cooperative Education 2019 Refereed Conference Proceedings*.

Mahapoonyanont, N. (2020). Educational innovation based on assessment for learning concepts: A guide to drive Education 4.0. *GATR Global Journal of Business Social Sciences Review, 8*(2), 132-143.

Ministry of Education. (2001). *English curriculum standards for compulsory education*. Beijing Normal University Publishing Group.

Nai Pat, O. (2010). *Quantitative and qualitative research methodologies in behavioral and social sciences*. Samlada.

Panich, V. (2020). *World-class quality education*. Siam Commercial Foundation.

Phattrakanan, N. (2012). Development of a training kit using experiential learning processes to foster public-mindedness for youth volunteers. Doctoral dissertation, Department of Adult Education, Graduate School, Srinakharinwirot University.

Phromwong, C. (2013). Testing the effectiveness of media or instructional kits. *Silpakorn Journal of Educational Research, 5*(1), 5.

Phromwong, C., et al. (2008). *Instructional kits in the curriculum development and instructional media course syllabus* (2nd ed.). Sukhothai Thammathirat Open University.

Phosri, R. (2006). Creation of learning activity kits. Faculty of Education, Uttaradit Rajabhat University.

Pongsopa, P. (1999). *Educational psychology*. Phatthana Suksa.

Rawangkarn, J. (2012). Development of an integrated training kit on services for the volunteers of the National Science Museum Organization. Master of Education thesis, Rajamangala University of Technology Thanyaburi, Department of Educational Technology and Communication.

Sai Hong, S., & Wittayakiat, S. (2011). Production and use of training kits for non-formal education. In *Sukhothai Thammathirat Open University's course materials for media development and usage in non-formal education, units 9-15*. Sukhothai Thammathirat Open University.

Sangsawang, T. (2016). Synthesis of Gagné's learning theory, constructivism, and constructionism for training-based learning. In *Proceedings of the 2nd National Industrial Education Conference on Science and Technology Teaching in Vocational Education under the Sufficiency Economy Philosophy*. Rajamangala University of Technology Krungthep.

Stiggins, R. J. (2002). Assessment crisis: The absence of assessment for learning. *Phi Delta Kappan, 83*(10), 758-765.

Stiggins, R. (2005). From formative assessment to assessment for learning: A path to success in standards-based schools. *Phi Delta Kappan, 87*(4), 324-328.

Sukhothai Thammathirat Open University. (2001). *Theory and practice of educational management, units 5-8* (3rd ed.). Sukhothai Thammathirat University Press.

Teachers Council of Thailand. (2013, September 19). *Regulations of the Teachers Council on professional standards and ethics, 2013*. Royal Gazette, 130(Special Part 130 Ng.), 66.

Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Association for Supervision and Curriculum Development.

Phuprang, W. (2020). Development of online training kits based on collaborative learning to improve mathematics test scores for Grade 6 students. Master of Education thesis, Rajamangala University of Technology Thanyaburi, Department of Educational Technology and Communication.

Supsombat, W. (2006). Development of a teacher evaluation culture: School-based training using networking and reflective thinking. Chulalongkorn University.